I-8 CORRIDOR PROFILE STUDY

ARIZONA / CALIFORNIA STATE LINE TO JUNCTION I-10

ADOT Work Task No. MPD 042-15
ADOT Contract No. ADOT11-013154

Draft Working Paper 5: Strategic Solutions

June 2016

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This report was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data, and for the use or adaptation of previously published material, presented herein. The contents do not necessarily reflect the official views or policies of the Arizona Department of Transportation or the Federal Highway Administration, U.S. Department of Transportation. This report does not constitute a standard, specification, or regulation. Trade or manufacturers' names that may appear herein are cited only because they are considered essential to the objectives of the report. The U.S. government and the State of Arizona do not endorse products or manufacturers.

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ACRONYMS

ADOT	Arizona Department of Transportation
BCA	Benefit-Cost Analysis
CCTV	Closed Circuit Television
CS	Candidate Solution
DMS	Dynamic Messaging Signs
EB	Eastbound
I	Interstate
IRI	International Roughness Index
ITS	Intelligent Transportation System
LCCA	Life-Cycle Cost Analysis
MP	Milepost
OP	Overpass
MAG	Maricopa Association of Governments
MPD	Multimodal Planning Department
P2P	Planning to Programming
RWIS	Road Weather Information System
SCMPO	Sun Corridor Metropolitan Planning Organization
SR	State Route
TI	Traffic Interchange
UP	Underpass
WIM	Weigh-In-Motion
WB	Westbound
YMPO	Yuma Metropolitan Planning Organization

1 INTRODUCTION

The Arizona Department of Transportation (ADOT) has identified eleven corridors considered essential in defining the overall health of the statewide transportation system, and is conducting a series of Corridor Profile Studies to plan for their desired performance. These Corridor Profile Studies will link the statewide plan, *What Moves You Arizona*, and the *Planning to Programming Linkage (P2P),* which are part of a framework designed to integrate the planning and programming processes in a transparent, defensible, logical, and reproducible way.

The eleven corridors are being evaluated within three separate groupings.

The first three studies (**Round 1**) began in spring 2014, and encompass:

- I-17: SR 101L to I-40
- I-19: I-10 to Mexico International Border
- I-40: California State Line to I-17

The second round (**Round 2**) of studies, initiated in spring 2015, include:

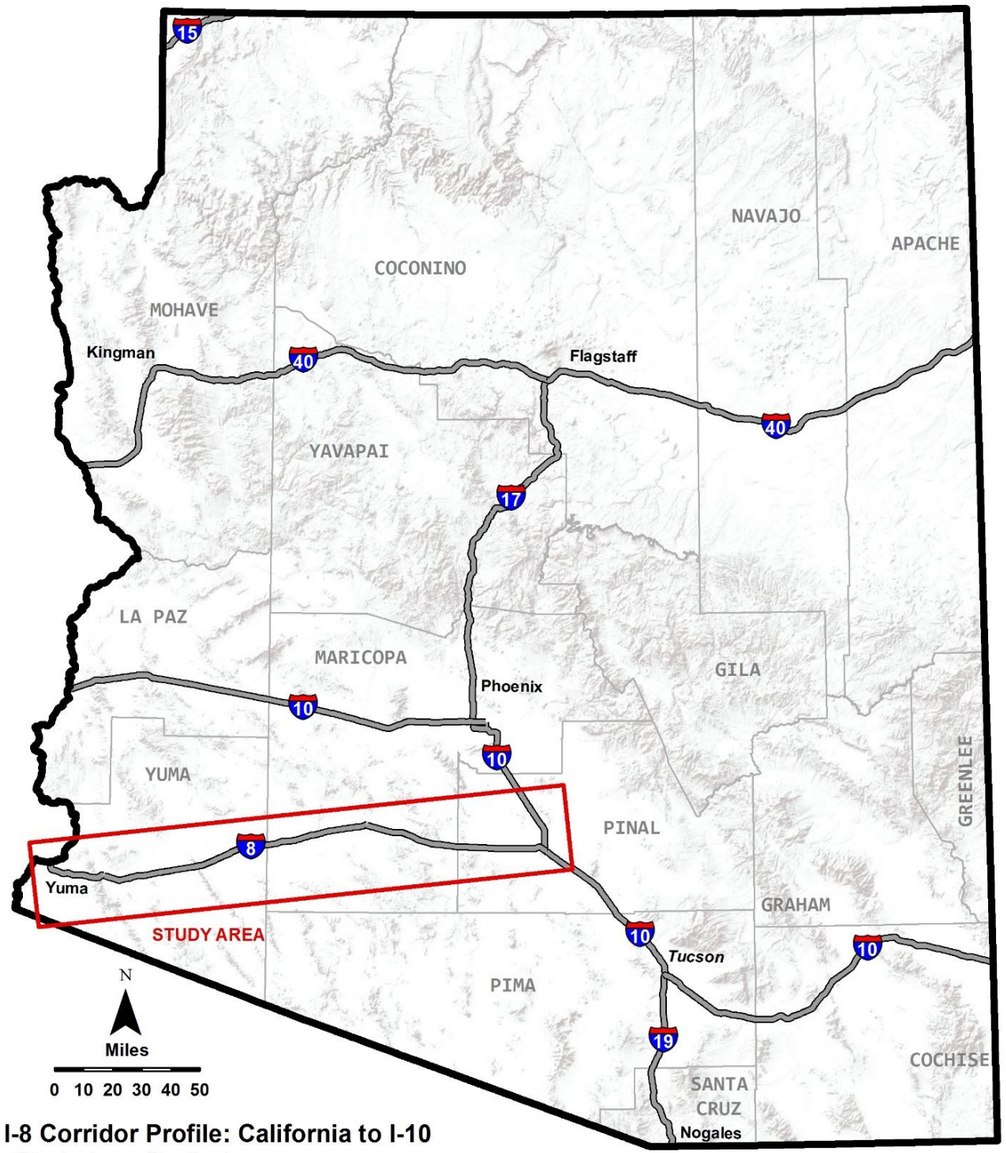
- I-8: California State Line to I-10
- I-40: I-17 to New Mexico State Line
- SR 95: I-8 to I-40

The third round (**Round 3**) of studies began in November 2015, and include:

- I-10: California State Line to SR 85 and SR 85: I-10 to I-8
- I-10: SR 202L to New Mexico State Line
- SR 87/SR 260/SR 377: SR 202L to I-40
- US 60/US 70: SR 79 to US 191 and US 191: US 70 to SR 80
- US 93/US 60: Nevada State Line to SR 303L

Interstate 8 (I-8), depicted in **Figure 1**, is one of the strategic statewide corridors identified and the subject of this Corridor Profile Study (**Round 2**).

Figure 1: Corridor Study Area



I-8 Corridor Profile: California to I-10
Study Area Context

1.1 Corridor Study Purpose

The purpose of the I-8 Corridor Profile Study is to define a comprehensive corridor planning and programming approach to help make system decisions to Arizona's transportation primary network. This is to be achieved by measuring corridor performance and using the findings to inform improvement solutions. Life-cycle cost analysis and risk assessment are to be applied in formulating corridor recommendations. This Corridor Profile Study, along with similar studies for the other ten strategic corridors, will:

- **Inventory** past improvement recommendations
- Define **goals and objectives** for the future of the corridor
- Assess **existing performance** based on quantifiable performance measures
- Propose various **solution sets** to improve corridor performance in light of the vision
- **Identify projects** that provide quantifiable benefit relative to performance
- **Prioritize** the projects for future implementation.

1.2 Corridor Study Goals and Objectives

The primary objective of this study is to identify a recommended set of potential projects for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The I-8 Corridor Profile Study will define solution sets and improvements that can be evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance. Corridor benefits will be categorized by the following three investment types:

- **Preservation:** Activities that protect transportation infrastructure by sustaining asset condition or extend asset service life.
- **Modernization:** Highway improvements that emphasize upgrading efficiency, functionality, and safety over adding capacity.
- **Expansion:** Improvements that add transportation capacity through the addition of new facilities and or services.

This study will identify potential actions to ensure the performance of the I-8 corridor is maintained at acceptable levels. Proposed actions will be compared based on their risk to achieving desired performance levels, life-cycle costs, and cost-benefits to produce a prioritized list of projects that help achieve corridor goals. The following goals have been identified as the outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Match solutions with needs in measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

1.3 Working Paper 5 Overview

The objective of Working Paper 5 is to document the development of strategic solutions derived from a performance-based needs assessment of the I-8 corridor. Corridor needs were defined in Working Paper 4 through a review of the difference between baseline performance (Working Paper 2) and desired performance (Working Paper 3).

1.4 Corridor Overview

A national transportation corridor, I-8 spans between San Diego, California and Casa Grande, Arizona. In Arizona, I-8 originates at the Colorado River in the City of Yuma and extends approximately 178 miles east to Casa Grande at the junction with I-10. Traveling east beyond Yuma, the corridor continues through Yuma County and the Town of Wellton, passes through Gila Bend in Maricopa County and terminates at the I-10 junction southeast of Casa Grande in Pinal County. Much of the I-8 corridor is rural and undeveloped.

The entire length of the Arizona segment of I-8 is the subject of this Corridor Profile Study. Viewed as more than a highway, the corridor is a multimodal facility that moves people and freight and connects communities. The corridor serves a variety of uses, from supporting freight movement, to transporting produce from the "lettuce capital of the US" near Yuma, to accessing tourism/recreation centers west in San Diego, California, to serving the growing Sun Corridor in central Arizona.

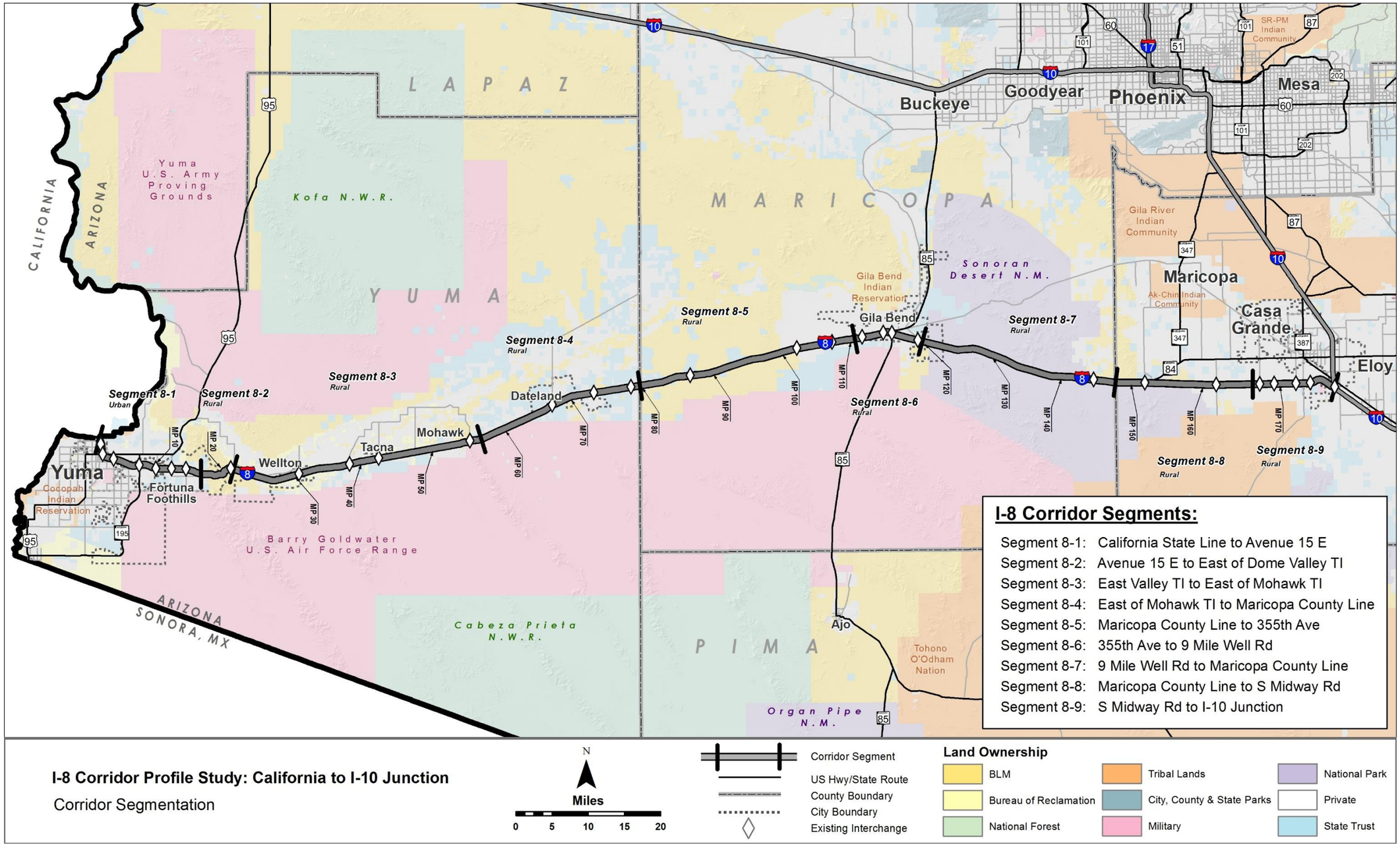
1.5 Study Location and Corridor Segments

The I-8 Corridor Profile Study limits extend from the California Border, milepost (MP) 0, to the junction with I-10 in Casa Grande, MP 178.33, which is approximately 178 miles. Identification of highway segments for study consideration was given to roadway, traffic and jurisdictional characteristics to allow for the appropriate level of analysis for similar operating environments. Nine segments have been identified by the project team, as shown in Table 1 and on Figure 1.

Table 1: Corridor Segments and Descriptions

Segment	Begin	End	Begin MP	End MP	Length (mi)	Thru Lanes (EB,WB) WB)	ADT (2013)	Character Description
8-1	California State Line	Avenue 15 E	0.0	16.3	16.30	2, 2	20,500 - 41,200	This segment starts at the California Border, traversing the urban area of Yuma and including 7 TIs for access. Within the limits, I-8 was constructed on new alignment away from old US 80, now Business 8 (B-8). At Avenue 9E, I-8 returns to the old US 80 alignment utilizing parallel frontage roads. Avenue15E serves as the Yuma city limit, with significant changes in terrain, level of development and traffic volumes.
8-2	Avenue 15 E	East of Dome Valley TI	16.3	21.4	5.05	2, 2	12,700 – 14,900	I-8 crosses through the mountainous terrain of Telegraph Pass, utilizing the old US 80 alignment. The US Border Patrol Station is also located in this section. One TI is located within Segment 8-2.
8-3	East of Dome Valley TI	East of Mohawk TI	21.4	56.5	35.08	2, 2	9.600 – 12,700	I-8 was constructed on a new alignment within this rural segment. Four TIs provide access to the local communities. The terrain is uniform except for the easternmost mile where Mohawk Pass allows a small mountain range to be crossed. There is little fluctuation in traffic numbers across this segment.
8-4	East of Mohawk TI	Maricopa County Line	56.5	79.6	23.36	2, 2	9,700 – 10,200	This segment is considered a rural operating environment and terminates at the Yuma County/Maricopa County line, which is also the break point between the Yuma Metropolitan Planning Organization (YMPO) and Maricopa Association of Governments (MAG). Beginning at the Mohawk TI, I-8 utilizes old US 80 as the eastbound roadway. Additionally, the county line has generally been used as a project limit. Two TIs are inclusive.
8-5	Maricopa County Line	355th Avenue	79.6	110.4	30.53	2, 2	12,900 – 16,600	This segment starts at the county line and ends at approximately the western limits of Gila Bend. This segment is differentiated by jurisdiction rather than any changes in terrain or traffic. Four TIs provide local access.
8-6	355th Avenue	9 Mile Well Road	110.4	120	9.62	2, 2	5,700 – 12,900	I-8 crosses the Gila Bend area between East and West TIs with a total of 4 TIs serving the area. The mainline roadway is on new alignment. Traffic numbers in this segment increase due to the B-8 and SR 85 junctions.
8-7	9 Mile Well Road	Maricopa County Line	120	147.6	27.60	2, 2	5,100 – 5,700	This segment runs from east Gila Bend to the Maricopa / Pinal County Line. One TI falls within the limits of Segment 8-7.
8-8	Maricopa County Line	S Midway Road	147.6	166.5	19.00	2, 2	5,100 – 5,300	This segment is defined by jurisdiction. Midway Road is assumed to be the western limits of Casa Grande development. The jurisdictional boundary between MAG and the Sun Corridor Metropolitan Planning Organization (SCMPO) occurs within this segment at approximately MP 160. Two TIs provide local access.
8-9	S Midway Road	Interstate 10	166.5	178	11.75	2, 2	5,500 – 9,500	This segment is defined as entering into the greater Casa Grande area. This segment terminates at the junction with I-10 and includes 5 TIs.

Figure 2: Corridor Segmentation



2 SUMMARY OF CORRIDOR NEEDS

2.1 Summary of Needs

Working Paper 4 documented the framework for the performance-based needs assessment process and the results for the I-8 corridor. The needs in each performance area were classified as either None, Low, Medium, or High based on how well each segment performed in the existing performance analysis conducted in Working Paper 2. The needs for each segment were combined to numerically estimate the average level of need for each segment of the corridor.

During the Corridor Performance Goals and Objectives establishment for I-8 (Working Paper 3), the Mobility, Safety and Freight Performance Areas were identified as Emphasis Areas, reflecting the primary future functionality of the corridor as a significant facility for the movement of international goods. Therefore, a weighting factor of 1.50 was applied to those needs during the calculation process in order to ensure appropriate attention to the developing commercial route.

The needs for the I-8 corridor are summarized below. **Figure 2: Summary of Needs** shows all needs identified in the assessment, ranging from None to High.

Pavement Performance Area

- Of the 178 corridor miles, approximately 76 miles on eastbound I-8 and 79 miles on westbound I-8 have been identified to have pavement needs.
- Pavement hot spot failure needs were identified for 9 miles on eastbound I-8 and 17 miles on westbound I-8 (discounting those miles that will be addressed by future programmed projects).
- A high level of historical investment has occurred on Segment 8-1 through the Yuma urbanized area (MP 0-16) which may warrant further investigation or alternative solutions.

Bridge Performance Area

- Bridge needs were identified on 30 of the 115 bridges along the I-8 corridor (26%).
- 11 bridges showed potential historical rating issues and may be candidates for life-cycle cost analysis to evaluate alternative solutions.
- 2 bridges have bridge ratings of 4; Colorado River Viaduct EB and Thornton Rd TI UP.
- 16 bridges were defined as hot spots since they had multiple bridge ratings of 5 or less.
- Of the 16 hot spot bridges, 3 also showed historical rating issues. These included the Smith Road OP EB, Smith Road OP WB and Thornton Rd TI UP.

Mobility Performance Area

- Mobility Performance is an Emphasis Area for the I-8 corridor, giving it a heavier weight in the analysis.
- A low level of mobility need was identified on 31 miles of I-8, concentrated in the Yuma urbanized area, Telegraph Pass, and Gila Bend. Contributing factors include reoccurring congestion and overall high traffic volumes in the urbanized area, the border patrol checkpoint at MP 18 creating eastbound delays, and closures related to incidents/accidents.
- I-8 between MP 18-21 experiences a reduction in shoulder width to accommodate bicycles.

Safety Performance Area

- Safety Performance is an Emphasis Area for the I-8 corridor, giving it a heavier weight in the analysis.
- In the urbanized Yuma area, most incidents/crashes were related to collisions with other motor vehicles, high speed, and run off the road to the right.
- Outside the urbanized area, many incidents/crashes were involving a single vehicle and involved the vehicle overturning or running off the road to the left. In these cases, driver inattention/distraction and high speeds were typically related, as well as involving a vehicle in transport.
- It has been noted that guardrail could be upgraded corridor-wide, with some sections having been updated as part of pavement preservation projects.

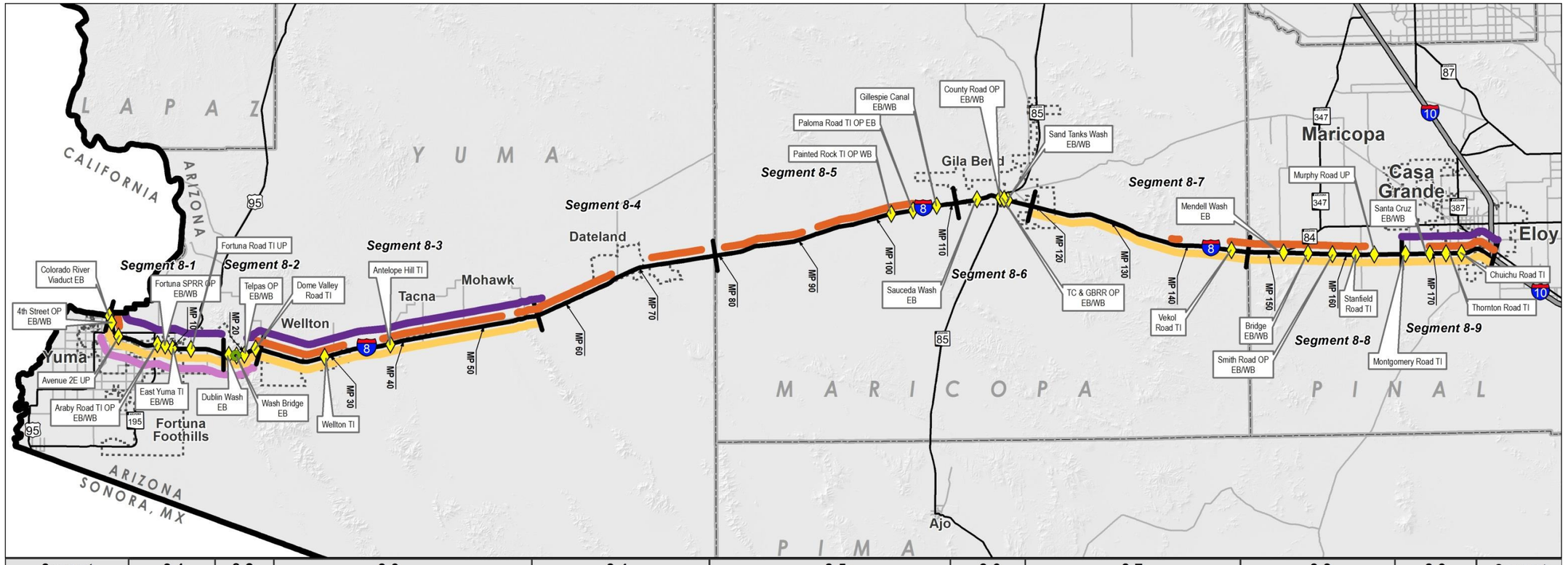
Freight Performance Area

- Freight Performance is an Emphasis Area for the I-8 corridor, giving it a heavier weight in the analysis.
- Low level of freight needs was identified on 98 miles of I-8. There are no Medium or High level of needs along the corridor. Segments 8-4 through 8-6 have no freight need
- Urban congestion in the Yuma area impacting freight movement including high volumes of freight traffic passing through and originating in Yuma.
- 6 bridges have clearance restrictions, consisting of less than 16.25’ clearance and no ramp. The Thornton Rd TI UP at MP 172.55 has low clearance of 15.87’.

2.2 Strategic Investment Areas

The principal objective of the corridor profile study is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State’s key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need (Medium or High). Addressing areas of Medium or High need will have the greatest effect on the corridor performance and are the focus of the strategic solutions. Segments with Medium or High needs and specific locations of hot spots are considered candidates for strategic solutions. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. The areas of the I-8 corridor identified for potential strategic investments are shown in Figure 4.

Figure 3: Summary of Corridor Needs



Segment	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	Segment
Pavement	Low	None*	Low	Low	Medium	None*	None*	Low	Low	Pavement
Bridge	Low	Med	Low	Low	Medium	Low	Low	Low	Medium	Bridge
Mobility (Emphasis)	Low	Low	None*	None*	None*	Low	None*	None*	None*	Mobility (Emphasis)
Safety (Emphasis)	Low	None*	Low	None*	None*	None*	None*	None*	Low	Safety (Emphasis)
Freight (Emphasis)	Low	Low	Low	None*	None*	None*	Low	Low	Low	Freight (Emphasis)
Average Need (0-3)	1.00	0.77	0.77	0.31	0.62	0.38	0.38	0.54	0.92	Average Need (0-3)

A segment need rating of **'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

I-8 Corridor Profile Study: California to I-10 Junction
Summary of Needs

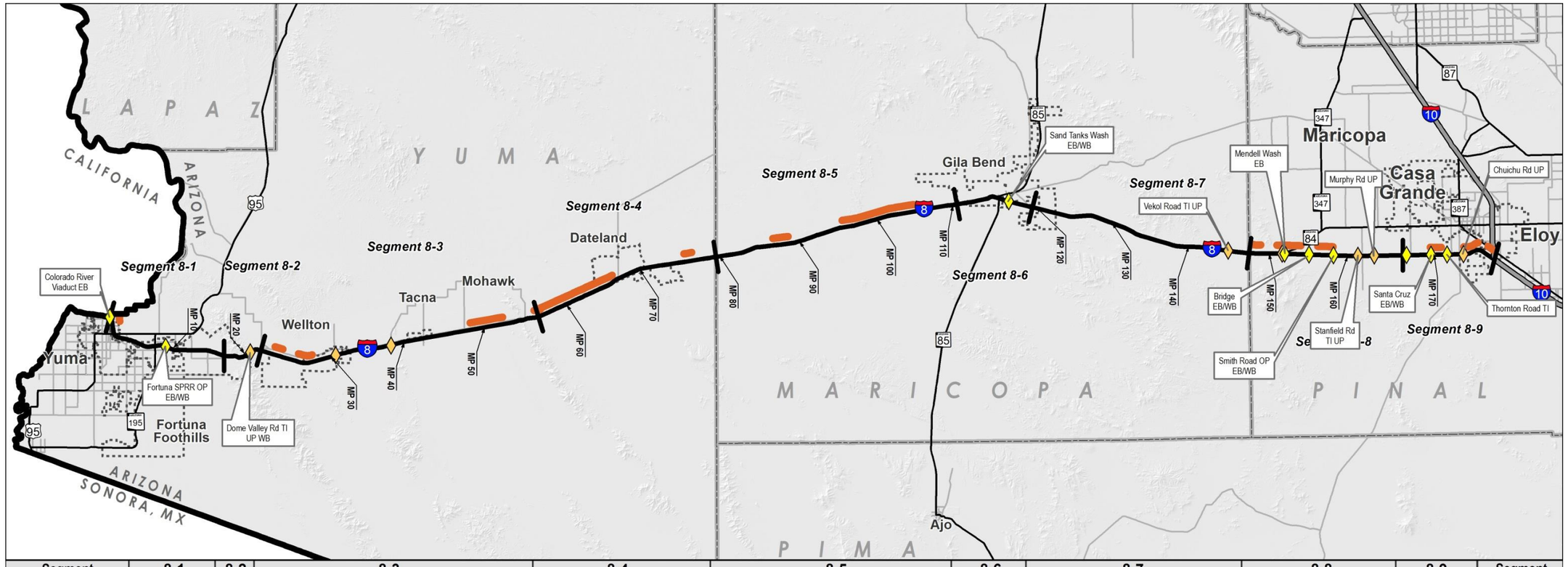
N
Miles
0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
Border Patrol Check Point

Needs Symbology
Safety
Pavement
Freight
Mobility
Bridge

Level of Need	Average Need Range
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

Figure 4: Strategic Investment Areas



Segment	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	Segment
Pavement	Hot Spot	-	Hot Spot	Hot Spot	Medium	-	-	Hot Spot	Hot Spot	Pavement
Bridge	Hot Spot	Med	-	-	Medium	Hot Spot	-	Hot Spot	Medium	Bridge
Mobility*	-	-	-	-	-	-	-	-	-	Mobility*
Safety*	-	-	-	-	-	-	-	-	-	Safety*
Freight*	-	Hot Spot	-	-	-	-	Hot Spot	Hot Spot	Hot Spot	Freight*

** Identified as Emphasis Area for I-8 Corridor*

I-8 Corridor Profile Study: California to I-10 Junction
Strategic Investment Areas

N
Miles
0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
Border Patrol Check Point

Needs Symbology
Safety
Pavement
Freight
Mobility
Bridge
Truck Height Restriction Hot Spot

Level of Need	Average Need Range
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

3 STRATEGIC INVESTMENT AREA SCREENING

This section examines qualifying strategic needs and determines if the needs in those locations require action. Table 2 notes if each potential strategic location will advance to solution set development, and if not, the reason for screening that location out of the solution development process. Locations advancing to solutions development are marked with Yes (Y); locations not advancing are marked with No (N) and highlighted.

In some cases, elevated needs do not advance to solution development and are screened out from further consideration because they have been or will be addressed through other measures, including:

- A project has already been programmed to address the need.
- The need is a result of a pavement or bridge hot spot that does not show historical investment issues. These hot spots will likely be addressed through other ADOT programming means.
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need. This bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes.
- The need is determined to be non-actionable (cannot be addressed through an ADOT project).
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need.

The remainder of the study focuses on developing appropriate solutions for the selected strategic locations. The screening table provides specific information about the needs in each segment considered for strategic investment. The table identifies the elevated needs - either Medium or High segment needs or segments without a Medium or High level of need that have a hot spot.

Each area of need has been assigned a Location Number to help document and track specific locations that are being considered for strategic investment throughout this process.

Table 2: Strategic Investment Area Screening

Segment	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-1 (MP 0.0-16.3)	Hot Spot	Hot Spot	-	-	-	L1	Pavement	Hot Spot in westbound lanes MP 0-1 (High IRI) and a high level of historical investment has occurred on Segment 8-1	Y	
						L2	Bridge	Hot Spot at Colorado River Viaduct EB MP 0.01 (#1700) with Deck Rating 4	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment. Further, this structure is maintained by Caltrans.
						L3	Bridge	Hot Spot at Fortuna SPRR OP EB (MP 8.69, # 1279) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L4	Bridge	Hot Spot at Fortuna SPRR OP WB (MP 8.70, #1280) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
8-2 (MP 16.3-21.4)	-	Medium	-	-	Hot Spot	L5	Bridge	Medium level of need, however none of the following structures within this segment were Hot Spots: Dublin Wash Br EB (MP 16.85, #1566) Wash Br EB (MP 18.12, #303) Telpas OP WB Over EB (MP 18.80, #971) Telpas OP WB Over EB (MP 20.40, #972) Dome Valley Rd TI UP EB (MP 21.04, #1324) Dome Valley Rd TI UP WB (MP 21.06, #1325)	N	Structures do not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L6	Freight	Hot Spot at Dome Valley Rd TI UP WB (MP 21.06 #1325) has low clearance of 16.23'. Cannot ramp around.	Y	
8-3 (MP 21.4-56.5)	Hot Spot	-	-	-	-	L7	Pavement	Hot Spot in EB lanes MP 23-24 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. A pavement preservation project is currently programmed (MP 21-29) for FY 2016, which will address deficiency.
						L8	Pavement	Hot Spot in EB lanes MP 26-28 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. A pavement preservation project is currently programmed (MP 21-29) for FY 2016, which will address deficiency.
						L9	Pavement	Hot Spot in EB lanes MP 48-52 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L10	Pavement	Hot Spot in WB lanes MP 56-56.5 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.

Segment	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-4 (MP 56.5-79.6)	**Hot Spot**	-	-	-	-	L11	Pavement	Hot Spot in WB lanes MP 56.5-67 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-4. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L12	Pavement	Hot Spot in EB lanes MP 76-77 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-4. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
8-5 (MP 79.6-110.4)	**Medium**	**Medium**	-	-	-	L13	Pavement	Hot Spot in EB lanes MP 87-89 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-5. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L14	Pavement	Hot Spot in EB lanes MP 96-99 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-4. A pavement preservation project programmed (MP 96-106) for FY 2019, which will address deficiency.
						L15	Pavement	Hot Spot in WB lanes MP 97-106 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-4. A pavement preservation project programmed (MP 96-106) for FY 2019, which will address deficiency.
						L16	Pavement	Hot Spot in EB lanes MP 100-103 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-4. A pavement preservation project programmed (MP 96-106) for FY 2019, which will address deficiency.
						L17	Bridge	Medium level of need related to three functionally obsolete bridges. None of the following bridges were identified as Hot Spots. Wash Bridge EB (MP 83.14, #317) Sentinel TI OP EB (MP 87.04, #687) Sentinel TI OP WB (MP 87.04, #688) Painted Rock TI OP EB (MP 102.27, #509) Painted Rock TI OP WB (MP 102.27, #510) Paloma Rd TI OP EB (MP 106.54, #566) Paloma Rd TI OP WB (MP 106.54, #567) Gillespie Canal Br EB (MP 107.02, #489) Gillespie Canal Br WB (MP 107.03, #568) Gillespie Canal Br EB (MP 109.55, #490) Gillespie Canal Br WB (MP 109.55, #569) Wash Bridge SFR (MP 110.35, #1505)	N	Structures do not have a historical rating issue according to the review, therefore they are not considered for strategic investment. Anticipated to be addressed through current ADOT bridge maintenance and preservation programming processes.

Segment	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-6 (MP 110.4-120.0)	-	**Hot Spot**	-	-	-	L18	Bridge	Hot Spot at Sand Tanks Wash Bridge EB (MP 117.43, #1343) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L19	Bridge	Hot Spot at Sand Tanks Wash Bridge WB (MP 117.43, #1344) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
8-7 (MP 120.0-147.6)	-	-	-	-	**Hot Spot**	L20	Freight	Hot Spot at Vekol Road TI UP (MP 144.55 #550) has low clearance of 16.19'. Cannot ramp around in eastbound direction.	Y	
8-8 (MP 147.6.0-166.5)	**Hot Spot**	**Hot Spot**	-	-	**Hot Spot**	L21	Pavement	Hot Spot in WB lanes MP 148-149 (High Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L22	Pavement	Hot Spot in WB lanes MP 151-153 (High Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L23	Pavement	Hot Spot in EB lanes MP 152-154 (High IRI and Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L24	Pavement	Hot Spot in WB lanes MP 156-158 (High IRI and Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L25	Bridge	Hot Spot at Mendell Wash Bridge EB (MP 151.90, #1064) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L26	Bridge	Hot Spot at Bridge EB MP 153.40 (#1066) with Deck Rating 5, Substructure Rating 5, Superstructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L27	Bridge	Hot Spot at Bridge WB MP 153.46 (#1067) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L28	Bridge	Hot Spot at Smith Road OP EB MP 157.55 (#1068) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5. Structure shows high level of historical rating issues in the historical review.	Y	

Segment	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-8 (MP 147.6.0-166.5)	**Hot Spot**	**Hot Spot**	-	-	**Hot Spot**	L29	Bridge	Hot Spot at Smith Road OP WB MP 157.55 (#1069) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5. Structure shows high level of historical rating issues in the historical review.	Y	
						L30	Freight	Hot Spot at Stanfield Rd TI UP (MP 161.6 #1090) has low clearance of 16.09'. Cannot ramp around.	Y	
						L31	Freight	Hot Spot at Murphy Rd UP (MP 162.5 #1091) has low clearance of 16.19'. Cannot ramp around.	Y	
8-9 (MP 166.5-178.3)	**Hot Spot**	**Medium**	-	-	**Hot Spot**	L32	Pavement	Hot Spot in EB lanes MP 170-171 (High IRI and High Cracking)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L33	Pavement	Hot Spot in EB lanes MP 174-176 (High IRI and High Cracking)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L34	Pavement	Hot Spot in WB lanes MP 174-176 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L35	Pavement	Hot Spot in EB lanes MP 177-179 (High IRI and High Cracking)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L36	Pavement	Hot Spot in WB lanes MP 178-179 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L37	Bridge	Hot Spot at Montgomery Rd TI UP (MP 167.50, #1140) with superstructure rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L38	Bridge	Hot Spot at Santa Cruz Wash Br EB (MP 170.90, #1142) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L39	Bridge	Hot Spot at Santa Cruz Wash Br WB MP 170.90 (#1143) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L40	Bridge	Hot Spot at Thornton Rd TI UP MP 172.55 (#1196) with Substructure Rating 4, Evaluation Rating 4. Structure shows high level of historical rating issues in the historical review.	Y	
						L41	Freight	Hot Spot at Thornton Rd TI UP (MP 172.55) has low clearance of 15.86'. Cannot ramp around in the eastbound direction.	Y	
						L42	Freight	Hot Spot at Chuichu Rd UP (MP 173.53 #1197) has low clearance of 16.04'. Cannot ramp around.	Y	

4 CANDIDATE SOLUTIONS

The corridor profile study identifies performance-based strategic solutions (investments) to help inform decision-making processes. This will enable ADOT to direct available funding resources to maximize the performance of the State's key transportation corridors. The corridor profile process is designed to mesh with the P2P Link and assigns strategic solutions to one of three categories for investment:

- Preservation
- Modernization
- Expansion

Documented performance needs serve as the foundation for developing strategic solutions for corridor preservation, modernization, and expansion. Strategic solutions are intended to complement ADOT's traditional project development processes through a performance-based analysis to identify needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Strategic solutions developed for key corridors will be considered along with other candidate solutions in the ADOT programming process.

4.1 Characteristics of Strategic Solutions

For the purposes of the corridor profile process, strategic solutions include the following characteristics:

- Do not recreate or replace results from normal programming processes.
- May include programs or initiatives, areas for further study, and infrastructure projects.
- Address elevated levels of need (high or medium) and hot spots.
- Focus on investments in Modernization projects (to optimize current infrastructure).
- Address overlapping needs.
- Reduce costly repetitive maintenance.
- Extend operational life of system and delay expansion.
- Leverage programmed projects that can be expanded to address other strategic elements.
- Provide measureable benefit (benefit/cost ratio, risk, LCCA, performance system, etc.).

4.2 Strategic Solutions Types

Establishing uniform solution types enables the corridor profile process to compare proposed solutions on and across corridors to determine the effectiveness at improving performance, including cost and risk comparisons to be undertaken in subsequent tasks. Appendix A provides a list of the preliminary solutions currently proposed for the corridor profile studies, separated into the three funding categories of Preservation, Modernization, or Expansion.

4.3 Candidate Solutions

The final step in this task is to identify candidate solutions that will be submitted for further analysis through the life cycle cost and risk analysis tasks. The project team accessed a variety of resources to identify solutions to address strategic investment areas:

- Field reviews
- Observable trends from performance analysis
- Discussions with districts
- ADOT technical groups
- Review previous reports
- National best practices
- Professional judgment

Table 3 identifies each location that has been assigned a candidate solution with a number (i.e. CS8.1, 8.2, etc.). Each candidate solution is comprised of one or more components to address the identified needs. The assigned CS numbers are linked to the location numbers to provide tracking capability back to the screening process. The locations of proposed solutions are shown in **Figure 5**.

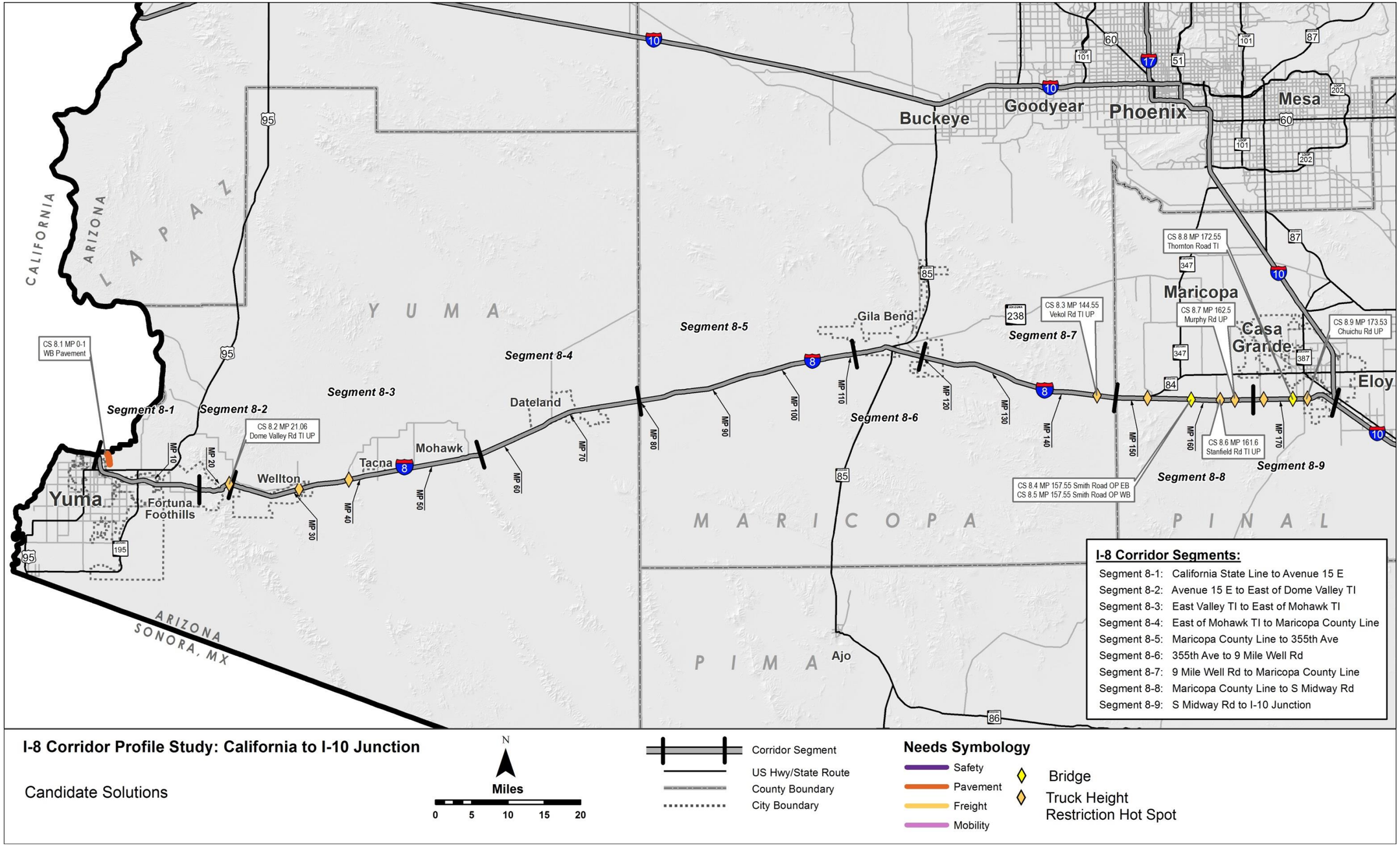
In some cases, multiple solutions are proposed for a single location. Solutions that are proposed to address needs at the same location with alternate approaches (e.g., Option A, B, or C) are advanced to the Life-Cycle Cost and Benefit-Cost Analysis evaluation in Task 6 to provide insights into the cost effectiveness of these options so a recommended solution can be identified. In locations where only one option has been developed, the next step is to advance that solution directly to the solution evaluation process for prioritization.

Solutions that are recommended to expand or modify the scope of an already programed project are noted but are not advanced to solution evaluation and prioritization. These solutions will be directly recommended for programming.

Table 3: Candidate Construction Program Solutions

Candidate #	Location #	Beginning Milepost	Ending Milepost	Name	Option	Scope	Investment Category Preservation (P) Modernization (M) Expansion (E)
CS8.1	L1	0	1	CA Border to MP 1 Pavement Project	A B	Rehabilitate pavement Replace pavement	P M
CS8.2	L6	21.06	21.06	Dome Valley Rd TI UP (#1325) Bridge Vertical Clearance Mitigation	A B C	Replace bridge Provide ramp Reprofile mainline	M M M
CS8.3	L22	144.55	144.55	Vekol Road TI UP (#550) Bridge Vertical Clearance Mitigation	A B C	Replace bridge Provide ramp Reprofile mainline	M M M
CS8.4	L31	157.55	157.55	Smith Road OP EB (#1068) Bridge Project	A B	Rehabilitate bridge Replace bridge	P M
CS8.5	L32	157.55	157.55	Smith Road OP WB (#1069) Bridge Project	A B	Rehabilitate bridge Replace bridge	P M
CS8.6	L33	161.6	161.6	Stanfield Rd TI UP (#1090) Bridge Vertical Clearance Mitigation	A B C	Replace bridge Provide ramp Reprofile mainline	M M M
CS8.7	L34	162.5	162.5	Murphy Rd UP (#1091) Bridge Vertical Clearance Mitigation	A B C	Replace bridge Provide ramp Reprofile mainline	M M M
CS8.8	L44 & L45	172.55	172.55	Thornton Rd TI UP (#1196) Bridge Project	A B C	Replace bridge Rehabilitate bridge and provide ramp Rehabilitate bridge and reprofile mainline	M M M
CS8.9	L46	173.53	173.53	Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation	A B C	Replace bridge Provide ramp Reprofile mainline	M M M

Figure 5: Candidate Solutions



I-8 Corridor Segments:

- Segment 8-1: California State Line to Avenue 15 E
- Segment 8-2: Avenue 15 E to East of Dome Valley TI
- Segment 8-3: East Valley TI to East of Mohawk TI
- Segment 8-4: East of Mohawk TI to Maricopa County Line
- Segment 8-5: Maricopa County Line to 355th Ave
- Segment 8-6: 355th Ave to 9 Mile Well Rd
- Segment 8-7: 9 Mile Well Rd to Maricopa County Line
- Segment 8-8: Maricopa County Line to S Midway Rd
- Segment 8-9: S Midway Rd to I-10 Junction

I-8 Corridor Profile Study: California to I-10 Junction

Candidate Solutions

N

Miles

0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

Needs Symbology

Safety
Pavement
Freight
Mobility

Bridge
Truck Height Restriction Hot Spot

4.4 Other Corridor Recommendations

In addition to the recommended construction program solutions identified in **Table 3**, this corridor profile study recommends that ADOT consider additional strategies for I-8 that are compatible with the long range vision to support international and interregional truck and freight movements:

- The analysis shows a high ratio of fatal to incapacitating injury crashes that are not clearly patterned to specific locations. This report recommends that a Roadway Safety Analysis should be conducted on the corridor in order to better understand the high occurrence of fatal crashes.
- Consider a corridor strategy to upgrade all bridges to current standards in anticipation of increased truck/freight traffic over the medium to long term.
- Consider corridor wide ITS solutions to assist truck/freight traffic over the medium to long term.

4.5 Policies and Initiatives

In addition to location-specific needs, general corridor and system-wide needs were also identified through the corridor profile process. While these needs are more overarching and cannot be individually evaluated through this process, it is important to document them as well. Therefore, a recommended policies and initiatives list was developed for consideration when programming future projects not only on I-8, but across the entire state highway system where the conditions are applicable. The following list, which is in no particular order of priority, was derived from the Round 1 and Round 2 corridor profile studies.

- Install ITS conduit with all new infrastructure projects.
- Prepare strategic plans for Closed Circuit Television (CCTV) and Road Weather Information System (RWIS) locations statewide.
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic messaging signs (DMS), and call box locations to expand ITS applications across the state.
- Consider solar power for lighting and ITS where applicable.
- Investigate ice formation prediction technology where applicable.
- Conduct highway safety manual evaluation for all future programmed projects.
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects.
- Develop standardized bridge maintenance procedures so districts can do routine maintenance work.
- Review historical ratings and investment level during scoping of all new pavement and bridge projects. In areas that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted.
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project.
- Expand programmed and future pavement projects as necessary to include shoulders.
- Expand median cable barrier guidelines to account for safety performance.
- Install CCTV with all DMS.
- In locations with limited communications, use CCTV to provide still images rather than streaming video.
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data.

5 NEXT STEPS

Candidate solutions identified in Working Paper 5 advance to be evaluated in multiple ways including a Life-Cycle Cost or Benefit-Cost Analysis (where applicable), Risk Analysis, and a Performance Effectiveness Analysis. The methodology and approach to this analysis is briefly described below and will be documented in detail in Working Paper 6. Figure 6 illustrates the candidate solution evaluation process.

Life-Cycle Cost Analysis – All pavement and bridge candidate solutions have multiple options: rehabilitate the area of need, or fully reconstruct the issue area or structure. These options will be evaluated through a life-cycle cost analysis (LCCA) to determine the best approach for each location where a pavement or bridge solution is recommended. The LCCA could eliminate options from further consideration and identify which options should be carried forward for further evaluation.

Benefit-Cost Analysis – Any mobility, safety, or freight strategic investment area that resulted in multiple independent candidate solutions will be evaluated through a benefit-cost analysis (BCA) to determine which solutions should be eliminated or carried forward through the candidate solution evaluation process.

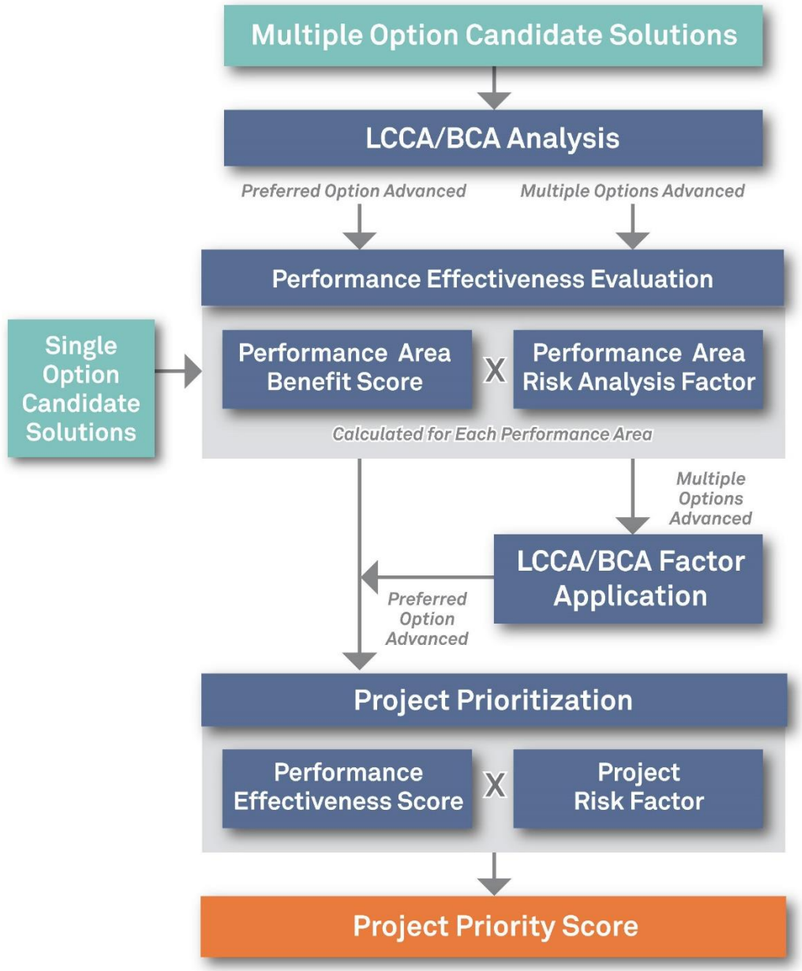
Performance Effectiveness Evaluation – After the LCCA and BCA processes are complete, all remaining candidate solutions will be evaluated based on their performance effectiveness. This process will include determining a performance effectiveness score based on how much each solution impacts the existing Performance and Needs scores for each segment. This evaluation will also include a Performance Area Risk Evaluation to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

Risk Analysis – All candidate solutions that are advanced through the Performance Effectiveness Evaluation will also be evaluated through a Risk Analysis process. This process will examine the risk of not implementing a recommended solution in terms of overall corridor performance. The results of this analysis will be combined with the Performance Effectiveness scores to determine the highest priority solutions in the corridor.

The highest ranking solutions will become recommended strategic investments for implementation and compared by ADOT to recommendations developed through other processes, such as the P2P Link process

Strategic investments are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and consultants develop candidate solutions for consideration in performance-based programming in the P2P Link process. Rather, these strategic investments are intended to complement ADOT's traditional project development processes with non-traditional projects to address performance needs in one or a combination of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Strategic investments developed for strategic corridors will be considered along with other candidate solutions in the ADOT programming process.

Figure 6: Candidate Solution Evaluation Process



APPENDIX A:

Solution Types

PRESERVATION

REHABILITATION

- Rehabilitate Pavement
- Rehabilitate Bridge

MODERNIZATION

GEOMETRIC IMPROVEMENT

- Re-profile Roadway
- Realign Roadway
- Improve Skid Resistance

INFRASTRUCTURE IMPROVEMENT

- Reconstruct to Urban Section
- Construct Auxiliary Lanes
- Construct Climbing/Passing Lane
- Construct Reversible Lane
- Construct Entry/Exit Ramp
- Construct Turn Lanes
- Modify Entry/Exit Ramp
- Replace Pavement
- Replace Bridge
- Widen Bridge
- Install Pedestrian Bridge
- Implement Automated Bridge De-icing
- Install Wildlife Crossing
- Construct Drainage Structure

OPERATIONAL IMPROVEMENT

- Implement Variable Speed Limits
- Implement Ramp Metering
- Implement Lane Control
- Implement Shoulder Running
- Implement Signal Coordination/Adjust Timing

ROADSIDE DESIGN

- Install Guardrail
- Install Cable Barrier
- Widen Shoulder
- Rehabilitate Shoulder
- Replace Shoulder
- Install Rumble Strip
- Install Safety Edge
- Install Wildlife Fencing
- Remove Tree/Vegetation
- Install Centerline Rumble Strips

ROADSIDE DESIGN (con't)

- Install Access Barrier Fence
- Install Rock-fall Mitigation

INTERSECTION IMPROVEMENT

- Construct Traffic Signal
- Improve Signal Visibility
- Install Raised Median
- Install Transverse Rumble Strips / Pavement Markings
- Single Lane Roundabout
- Double Lane Roundabout

ROADWAY DELINEATION

- Install High-Visibility Edge Line Striping
- Install High-Visibility Delineators
- Install Raised Pavement Markers
- Install In-lane Route Pavement Markings

IMPROVED VISIBILITY

- Cut Side Slopes
- Install Lighting

DRIVER INFORMATION/WARNING

- Install Dynamic Message Sign (DMS)
- Install Dynamic Weather Warning Beacons
- Install Speed Feedback Signs
- Install Chevrons
- Install Warning Signs
- Install Wildlife Warning System

DATA COLLECTION

- Install Road Weather Information System (RWIS)
- Install Closed Circuit Television (CCTV) Camera
- Install Vehicle Detection Stations
- Install Flood Sensors

EXPANSION

WIDEN CORRIDOR

- Construct New General Purpose Lane

ALTERNATE ROUTE

- Construct Frontage Roads